GLASS and GLAZING

A Handy Manual Containing
Valuable Information for
Architects and Builders

Pittsburgh Plate Glass Company
Milwaukee, Wisc.

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Glass and Glazing

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BY
CLARENCE WARNER CONDIE
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Preface

The object of this booklet is to present to the users of glass a standard or guide for the architect, owner or contractor, by which the material may be better known and more readily understood. It is the intention to briefly describe herein the more important and different kinds of glass for building purposes, with regard to adaptability for certain definite uses.

It would be difficult, and perhaps impossible, to adequately describe or define technical differences to a certainty, either by written description or through the medium of printed illustrations. These suggestions, therefore, are submitted with the hope that a careful reading will enable those who are to pass judgment to avoid the common errors which have invaded a field where no recognized authority has governed, and where abuses have often been permitted to appear in the absence of a strict and definite description of quality and kind.

Glass blowing is as old as any other industry and dates back to the earliest periods of the world's history, yet no general textbook on the selections of grades, or on the standardizing of the material has ever been issued in this country.

It is not the intention here to cover every department of structural glass or to go into the exhaustive details of the artistic; but to confine the work to the everyday materials which are often thought so simple as to need no consideration.

Plate Glass

PLATE glass can be made under the present improved methods in extreme sizes up to 250 square feet and in such measurements as 10 feet by 21 feet (or 120″x 252″) containing 210 square feet—12 feet by 20 feet (or 144″x240″) containing 240 square feet—13 feet by 19 feet (or 156″x228″) containing 247 square feet. Such extraordinary glass is very difficult to make, quite expensive and dangerous to clean or handle and, being especially made to order, entails delay in replacement when broken, requires special flat car shipment and special facilities for unloading and hauling, and the most expert and skilled glaziers in setting. Sizes are usually given in inches.

SIZES AND THICKNESSES

It is advisable to confine sizes to the ordinary limitations in order to secure prompt and economical deliveries from distributors' stocks.

On account of the extraordinary demand for certain sizes of plate glass for stock sizes in mirrors, windshields for automobiles, and stock door glazing, the proportionate production is below the consumption and a higher value is therefore placed upon these sizes, and their multiples.

¼″ to 5/16″ Polished plate glass is manufactured in thicknesses ranging from ⅛″ to 1½″; THE STANDARD PRODUCT RUNS FROM ¼″ to 5/16″ FULL. The other thicknesses (whether thicker or thinner) are made specially, and at an increased cost.

THE SASH OR RABBET FOR REGULAR PLATE GLASS GLAZING SHOULD BE MADE TO ACCOMMODATE GLASS FULL 5/16 OF AN INCH THICK.

THICK PLATE ⅜″ ½″ ⅝″ ¾″ ⅞″ 1″ 1¼″ 1½″

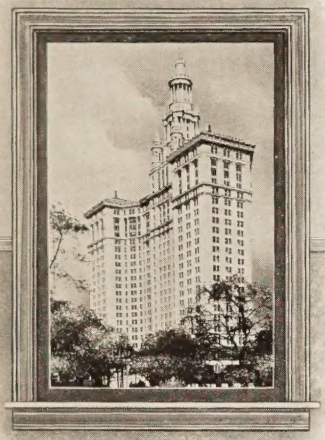
Glass thicker than the standard product is used for counter tops, deal plates, port and deck lights on ships, aquariums, etc.

THIN PLATE ⅛″ 3/16″ One-eighth inch to three-sixteenth inch glass is used largely for residence windows and by car builders and for boat sash, automobile windshields; and for other special purposes where perfect surfaces, high polish, and absolute clear vision is wanted, with minimum weight.

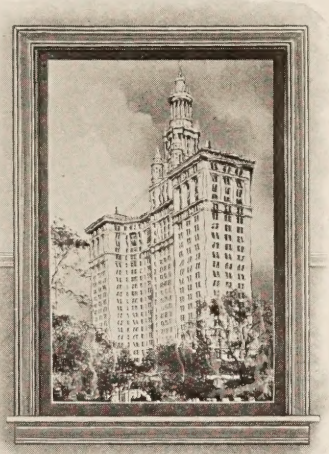
COST Notwithstanding the tremendous investment required, the comprehensive machinery and materials used in manufacturing, the cost has been scientifically reduced so that plate glass is no longer considered a luxury and is every day increasing in popularity for general glaz-

PLATE GLASS (Continued)

ing of high-class buildings, store-fronts, show-cases, for table and desk covering, dresser tops, chiffoniers, buffets, tabourets, shelves, etc. The use of plate glass adds an elegance and finish wherever it is seen. The cost of glazing buildings with plate glass is not prohibitive, and architects and builders will do well to make an intelligent comparison of figures and consider the enhanced value, beauty and durability, accurate vision obtained in the use of plate glass.



Clear vision afforded by the use of Plate Glass.



Distorted vision through the ordinary window-glass.

CAUTION

Polished plate glass should never be allowed to remain in packing cases longer than necessary, as dampness may stain the surface. Whether boxed or open, glass should be kept on edge.

WEIGHT

Plate glass in regular glazing thickness (¼″ to 5/16″ thick) weighs 3½ pounds per square foot bare and may be computed at approximately five pounds per square foot boxed for shipment. A rule for figuring shipping weight of plate glass is found in the official prict-list as follows:

Extend the glass at 3½ pounds per square foot. Weight of box equals the contents of a plate of greatest width and length of those packed therein, multiplied by 10. Thus:

1 plate, 36″x96″ } =59′x3½ =206½ pounds.
1 plate, 60″x84″ }
Size of box 60″x96″=40′ x10 =400 pounds.
606½ pounds.

See page 45 for table of net and gross weights of different thicknesses.

PLATE GLASS (Continued)

Among the many who use glass there are so few who are familiar with its ingredients and its methods of production that we deem it fitting to describe some of the details of manufacturing the two principal products, and believe that a more familiar knowledge of plate and window glass will be both interesting and instructive.

The raw materials may be said to be virtually the same in plate glass as in window glass—the main difference in the finished products being due to the great care exercised in selecting and purifying the ingredients, and the elaborate method of casting, grinding and polishing plate glass as compared to the simple and rapid process of producing window glass from blown cylinders.

While both require skill and painstaking care on the part of the operator, the one will never equal the other in appearance or efficiency while the methods of production are so widely different.

Plate glass was first made in France in 1688 and the term "French Plate Glass" or "French Mirrors" has its origin from the development of the plate glass industry in France. The first cast plate made in the United States was produced in 1860 and perfected a few years later so that it may be noted that this is a modern product compared to window glass which was made during the early settlement of this country, at Jamestown, Va., about 1608. The making of ordinary glass has been included in the industries of almost every country in the world and dates back to ancient Egypt, centuries ago.

INGREDIENTS

The principal ingredients are silica (white-sand) soda (soda-ash) and lime (lime-stone). Also arsenic, charcoal and cullet (broken glass).

As stated before, the method of producing plate glass widely differs from window glass and it is little known that the melting, casting, rolling, annealing, grinding and polishing of plate involves the mining of silica and coal, the quarrying of limestone, the chemical manufacture of soda-ash on a large scale, the reduction and treatment of fire-clay and an elaborate system of pot-making for crucibles, all of which requires an

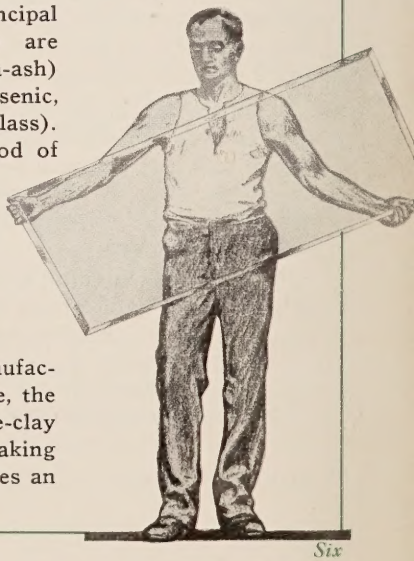


PLATE GLASS (Continued)

enormous financial investment, a multitude of men, and extensive factory properties.

It should be stated that the product of the American factories is, by comparison, equal in every way to the European plate glass in clearness, freedom from flaws and defects, homogeneousness and finish.

SPECIAL QUALITY AND THICKNESS

The making of irregular thicknesses, or superfine quality for mirrors or other uses where special glass is needed, requires special processes and entails additional expense in producing—and the making of beveled plates and mirrors necessitates two more elaborate lines of work and machinery and a corps of experts and skilled workmen.

POT MAKING

Pots of fire clay are such a heavy expense in plate glass manufacture and take so important a part in the successful making of plate glass that the subject deserves special notice. The different clays after being mined are exposed to the weather for some time to bring about disintegration.

At the proper stage finely sifted raw clay is mixed with coarse, burned clay and water. This reduces liability of shrinkage and cracking. It is then "pugged," or kneaded in a mill; kept a long time (sometimes a year) in storage bins to ripen; and afterwards goes through the laborous process of "treading." No machinery has thus far been invented by which the plasticity can be developed as does this primitive treading by the bare feet of men. The clay must be treaded many times. The building of the pots is a slow, tedious and time-killing affair; but this is essential.

Without extreme care, some elements used in the making of the pots might be fused into glass while undergoing the intense heat of the furnace; or they might break in the handling, and much depends upon the strength of the pots.

The average pot must hold about a ton of molten glass, and the average furnace heat necessary is about 3000 degrees Fahrenheit.

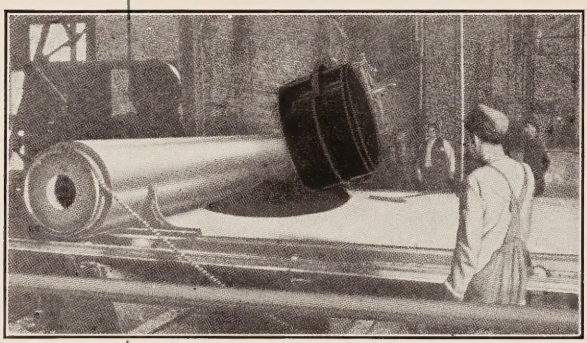
After completion comes the proper drying out of the pots; and this is another feature in which the greatest scientific care is required. No pot may be used until it has been left to season for at least three months, and even a year is desirable. And after all this, the pot has but twenty-five days of usefulness.

PLATE GLASS (Continued)

MELTING AND CASTING

The pot, having been first brought to the necessary high temperature, is filled heaping full with its mixed "batch" of ground silica, soda, lime, cullet, etc. Melting reduces the bulk so much that the pot is filled three times before it contains a sufficient charge of metal.

When the proper molten stage is reached the pot is lifted out of the furnace by a crane; is first carefully skimmed to remove surface impurities, and then carried overhead by an electric tramway to the casting table. This is a large, massive, flat table of iron, having as an attachment, a heavy iron roller, which covers the full width, and arranged so as to roll the entire length of the table. The sides of the table are fitted with adjustable strips which gauge the production of plates of different thickness. The pasty, or half-fluid glass metal is now poured upon the table from the pot, and the roller quickly passes over it, leaving a layer of uniform thickness. The heavy roller is now moved out of the way, and then by means of a stowing tool the red hot plate is shoved into an annealing oven or lehr. The plates remain for some time in the lehrs, where the temperature is gradually reduced.



When the plate is taken from the annealing ovens it has a rough, opaque, almost undulating appearance on the surfaces. Only the surface, however, for within it is clear as crystal. First, it is submitted for careful inspection, and then goes to the cutter who takes off the rough edges and squares it into the right dimensions; and thence to the grinding room.

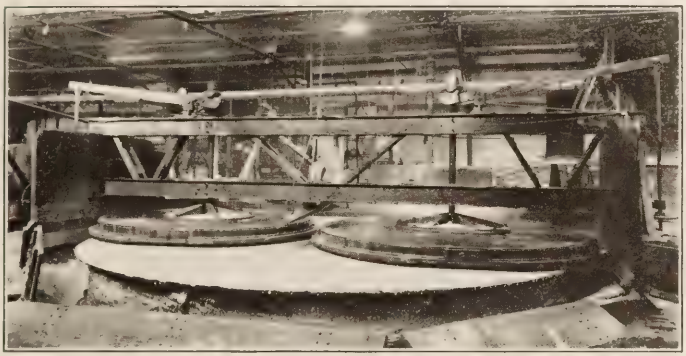
GRINDING AND POLISHING

The grinding table is a large flat revolving platform made of iron, twenty-five feet or more in diameter. This table is prepared by being flooded with plaster of paris and water; then the glass is carefully lowered, and men mount upon the plate and tramp it into place

PLATE GLASS (Continued)

until it is set. After this, greater security is obtained by pegging with prepared wooden blocks; and the table is set in motion. The grinding is done by revolving runners. Sharp sand is fed upon the table, and a stream of water constantly flows over it. After the first cutting by the sand, emery is used in a similar manner. The plates are inspected after leaving the grinding room, and if scratches or defects are found they are marked.

There are also, not infrequently, nicks and fractures found at this stage; and in such case the plate must again be cut and squared, or if the defects are too great, the plate



is broken up for cullet. The polishing is done on another special table by means of special reciprocating machinery, using rouge, (iron peroxide), applied with water, and rubbing the glass with blocks of felt so arranged that every part of the plate is brought underneath the rubbing surface. The grinding and polishing has reduced the original plate half of its thickness, sometimes more. The material washed away is lost and fully half the original weight of lime and soda has vanished, and even at the completion, the inspectors very carefully scrutinize the glass for excessive defects and reject that which is not up to quality.

GRADING AND QUALITY

New plate is sea-green, looking at the "metal" through the edge, which gradually fades when exposed for a period to sunlight and weather, to a yellow or light brown color due to the action of the elements upon the chemical constituents of the glass.

In the finished product (glazing quality) there may appear some defects, which in no way impair the value, beauty, or durability of the glass for ordinary use—such as small seeds or bubbles, short-finish, reams or surface scratches,

PLATE GLASS (Continued)

which are accepted as contingent with the regular run of plate, and even an open bubble or shot-hole (not clear through both surfaces) is passed in standard glazing quality, providing the plate is comparatively free from other defects and of good color and finish.

SPECIAL QUALITY When glass of particular quality is desired, a special selection is necessary. This requires an expert in the grading and selection of the material, sometimes necessitates cutting down larger sizes to minimize the amount of defects inherent with the regular production, and adds a proportionate extra cost to special quality plate.

BEVELING The beveling of plate glass is of such interest and exemplifies such skill on the part of the workmen that a description of the process should be added to the information already written in the preceding chapter on plate glass.

The glass to be beveled is subjected to treatment in different departments of the beveling plant, each division working out its particular process in taking off the bevel and restoring the surface of the glass to its original polish.

Five divisions of skilled workmen are necessary; namely: roughers, emeriers, smoothers, white-wheelers and buffers (polishers) using different abrasive or polishing materials, such as sand or carborundum, emery, sand stone, pumice and rouge.

The roughing-mill or wheel is a circular cast-iron disc having a fine cut corrugated surface about 30″ in diameter, revolving rapidly upon its bearings as a horizontal plane. Sand or carborundum is conveyed to the mill from above through a hopper with a stream of water, so that the sand gives the desired roughness between the iron and the glass while the water minimizes the friction and heat.

ROUGHING (1) The edge of the plate is brought into contact with the swiftly moving roughing wheel, and the sand cuts the bevel to the desired depth. Curved and pattern plates with incurves, mitres, etc., require an expert practiced eye and great skill on the part of the operator.

EMERYING (2) In the first roughing process the beveled surface has been cut so deep by the coarse sand that it is necessary to follow with a finer abrasive in another mill to bring the bevel to a smoother finish, and emery or finer carborundum is used.

SMOOTHING (3) Then the rough grinding is still further smoothed in the stone mill, or

PLATE GLASS (Continued)

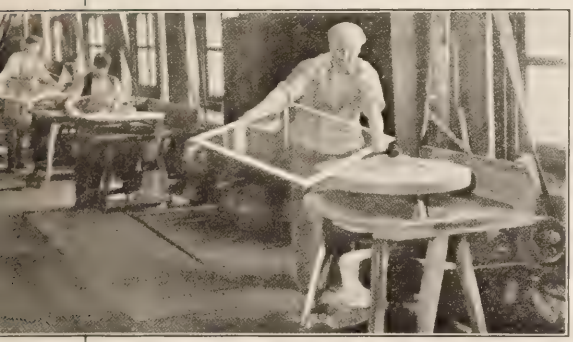
smoother, which is constructed upon the plan of the iron roughing wheel, using a circular revolving sandstone of fine texture with water flowing upon it to reduce friction.

POLISHING

(4) The first polishing process is upon a wood wheel in an upright position which brings the bevel to a dull, milky polish by the use of powdered pumice in solution automatically splashed upon the wheel by a paddle.

FINISHING

(5) The final high-gloss polish is put upon the beveled surface by the application of rouge upon the upright polishing wheel which is covered with a layer of thick felt.



REGULAR BEVEL 1½"

The standard width of bevel is 1½" and all beveled plate glass or beveled plate mirrors are furnished with 1½" bevel unless otherwise specified.

Slight scratches may be removed from the surface of plate glass by rubbing with pure thick felt mounted upon a hand-block, and using fine red or black rouge (moistened) as an abrasive. This must be skillfully done to avoid over-polishing or "burning" the delicate annealed surface of the plate.

GRINDING AND POLISHING EDGES

The value of plate glass for furniture tops, desks and tables, show-cases, shelves and numerous other purposes has become generally recognized. The covering of glass with treated edges offers a clean, sanitary surface and an elegant appearance and also beautifies, protects and preserves the furniture.

The process of grinding and polishing the edges, or rounding of corners, curves or pattern lines, is similar to the beveling, except that the work is done on the edge of the plate instead of the surface.

The edge of the glass is rough ground according to specifications, either rounded or squared or chamfered as desired, and finished through the polishing process—described in the previous chapter.

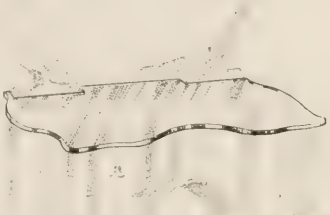


PLATE GLASS (Continued)

WHEEL-CUT MITRED WORK

For decorative effects on door-plates, side-lights, transoms, partition-glass, etc., the rich effect of mitred design gives a tone of elegance, and emphasizes the beauty of the glass.

The lines are cut V shape into the surface of the glass by a vertical wheel with sharp edges, and the smoothing and polishing is accomplished by the same general process as on the beveled edge. This is indentical in appearance and presents the richness and beauty of the finest cut tableware.

Mitred designs on plate glass mirrors or on rolled figured glass produce an elegant effect where special and elaborate decoration is wanted.

Mirrors

THE silvered surface of a mirror magnifies and accentuates the qualities of the glass to a great degree; hence it is necessary to use the finest grade of plate to secure good mirrors. This selection of quality necessarily entails the most scrupulous care in making and selecting glass for mirror purposes.

Every consideration must be given to both surface and general character, as the ordinary defects which would otherwise be unnoticed are sharply brought out by the covering of silver.

SILVERING

The formula of the silver solution for making mirrors varies but slightly with the different makers. The secret of success is in the process, and manner of treatment. Cleanliness is absolutely necessary. Chemically pure ingredients, distilled water and expert care with the proper facilities will produce mirrors that will stand for years without deterioration, whether by the cold or hot method.

After a thorough cleansing of the glass, removing all foreign substances from the surface, the "solution" is poured over the plate and by chemical precipitation a coat of pure silver is deposited.

MIRRORS (Continued)

This is permitted to dry and a preservative coating of shellac, with a coat of mirror-back paint completes the process. This is know as a patent-back mirror and is the standard highest grade.

A method of making mirrors by mercury process was tested for years but found unsatisfactory from a commercial standpoint, and has become obsolete.

SIZES AND THICKNESS

The sizes of Polished Plate Glass Mirrors—are limited only by the sizes in which it is possible to make plate glass, and thin or heavy glass may be used as desired.

It must be remembered that extreme sizes in strictly clear plate of mirror quality are difficult to obtain and necessarily carry some ordinary techinal defects, which cannot be entirely eliminated. The larger the glass the more likely these defects will appear.

SHOCKS

The common sheet-mirror or looking-glass used principally for the reflection of light rather than for the detailed image, is known to the trade as a "Shock-Mirror," and is made from ordinary cylinder glass (window glass) and is very inferior in quality.

PROPER INSTALLATION

Mirrors are susceptible to the effects of extreme cold or heat and moisture, and should be mounted with proper protection against dampness. Care should be taken to avoid damp walls, or plaster which has not properly dried out, before installing mirrors.

In glazing French doors with mirrors, or on Colonial work where small mullion glazing is specified, it is essential to have the panels absolutely upon a uniform line and rabbets of accurate depth as the mirrors will otherwise reflect at different angles and distorted vision result.

A perfect effect may be obtained by using a back ground in large size mirror, and a false-mullion over all.

RESILVERING OLD MIRRORS

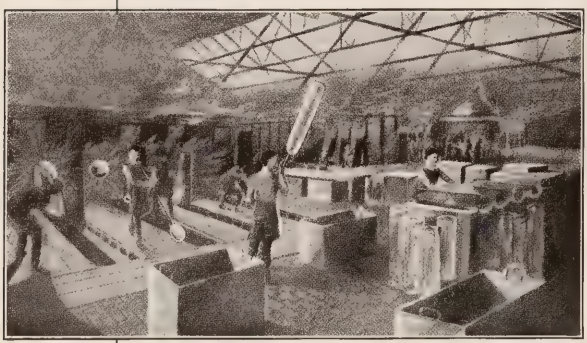
Old mirrors which have become stained, spotted or peeled, may be re-silvered by carefully removing all traces of the original backing and treating the glass as in the original silvering process. This is done at owner's risk of breakage and restores only the silvering, while any defects or scratches in the glass will remain.

Window Glass

THE quality of window glass or sheet glass, also termed "blown" or "cylinder glass," has been improved by the modern methods of production, and much has been expended in the effort to make perfect blown cylinder material. Yet there are still some waves and general defects accepted in all window glass, due to the process of making, which differs entirely from cast and polished plate.

The glass is blown in cylinder form and flattened by reheating, which gives it a slight bend or bow, a possible variation in thickness in the larger sizes, and surface flaws.

The selection of the various grades is a matter of expert judgment. The large sheets produced, in single or double thickness and heavier, are cut to stock sizes according to the merits of the glass and graded in "AA", "A" or "B" quality. The defects being eliminated to the greatest possible extent.



Blowing Cylinders by the human process—producing "Hand-Made" Window Glass.

The ingredients, as we have said, are practically the same in window glass as in plate—it is wholly a matter of refinement and process which produces the different kinds of material.

Window glass—is made by two methods — by "machine" or by "hand." The difference is in the blowing process—both producing the cylinder from which all window glass is evolved. The same general treatment of the cylinder, to produce flat sheet glass follows in both machine or human blown material, and both produce equally standard quality.

To make the cylinder the molten glass or "metal" is brought to proper consistency by extreme heat, and the glass in the human blown process is "gathered" upon the end of a tube (or blow-pipe) from the furnace and blown into a huge cylinder by repeated heatings and blowings, until the material is all evenly distributed. From a globular mass about the size of a man's head, the blower swings the pipe into an alley or opening in the floor, blowing as he swings until the full sized cylinder is formed. This requires skill of the highest degree —the blower, by regulating the amount of material entering

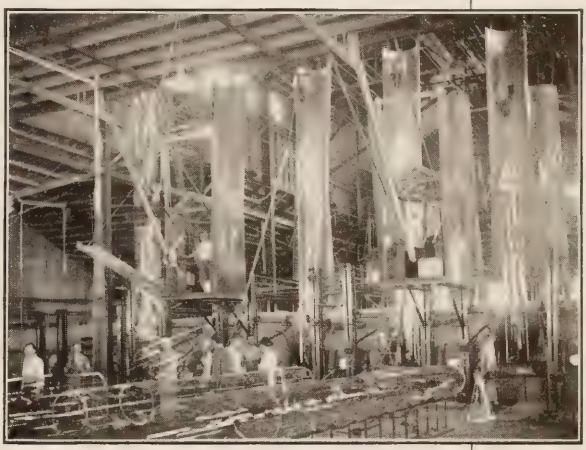
WINDOW GLASS (Continued)

the cylinder, makes single strength or double strength or heavier glass as desired.

The blowing machine accomplishes the same result by purely mechanical process—the intricate working of the mechanism, the supply of molten glass, the air pressure, rapidity of action, making single or double thickness, being controlled by a single operator who appears to have supernatural powers, surely never dreamed of throughout the great stretch of years when the glass-blower was master of the art and accredited with inimitable skill.

The cylinder is decapitated at both ends by an ingenious method of spinning a string of hot glass at the proper place, or by the use of a wire wrapped around the glass and electrically heated which causes the cap and crown to break off clean. The cylinder is then split lengthwise—placed in the flattening oven on a large circular stone, and as the heat is increased and as the glass begins to wilt it is quickly smoothed out to the shape of the flat stone, upon which it rests.

Cylinder glass cannot be perfectly flattened, and the waviness and bow or slight curve will always occur in this product.



Machine Blowing Factory—producing Window Glass Cylinders by Machinery.

In glazing--the bend or bow should be glazed outward in the sash—the bulge towards the exterior.

SIZES

Window glass in double strength, or heavier is made as large as 30″x90″ or 38″x86″ or 48″x80″ and such extreme sizes containing twenty-five square feet, but it is inadvisable to use such glass in these measurements on account of the liability of breakage and the distorted vision due to waves, etc.

The same may be said of the extreme sizes of single strength which can be made up to 24″x60″ or 30″x54″ or 36″x50″ in sizes containing ten to twelve and one-half sq. ft.

WINDOW GLASS (Continued)

PRICE LIST The current "Jobbers Window Glass List" gives full information regarding bracket sizes, list prices of all qualities and sizes in both single and double strength, in factory box lot, or by the light, and designates the number of lights per box in each size.

CRYSTAL SHEET GLASS A heavy blown glass, made by the same process as ordinary window glass and subject to the same inherent defects. Graded in "AA", "A" or "B" quality and made in various thicknesses: 26 ounce, 29 ounce, 34 ounce and 39 ounce (3/16" thick).

In examining samples of small size for inspection of quality, it should be remembered that the large light of glass will show the natural waves and defects, while the small piece may appear nearly perfect.

It is not altogether a matter of expert judgment to determine the various grades and certain rules may be accepted governing window glass specifications.

THICKNESS AND WEIGHT Single strength measures approximately twelve lights to the inch, but a small variation either way is permissable. Single strength weighs approximately 16 ounces to the square foot. Double strength measures approximately nine lights to the inch. The thickness should be fairly uniform and the weight approximately twenty-four ounces to the square foot.

FACTORY PACKAGES Window glass is packed in regular sizes approximately 50 square feet to the box up to the 100 united inch bracket (adding width and length), and 100 square feet to the box in sizes over 100 united inches.

SHIPPING WEIGHTS Single strength in factory packages weighs from 65 to 75 pounds to the box (shipping weight). Double strength in factory packages weighs from 85 to 110 pounds to the box, 50 feet boxes, (shipping weight.)

Double strength in 100 feet cases weighs approximately 225 pounds (shipping weight).

"AA" OR FIRST QUALITY "AA" quality should be clear glass, free from any perceptible amount of air bubbles or blisters, burnt specks or burns, cords and strings. It should have a good gloss and an even surface and be well flattened. By air bubbles it is

WINDOW GLASS (Continued)

understood that tiny blisters, or imperfections not perceptible on the cutters' table, but detectable when placing the sheet directly towards the light, would not be objectionable. This should be a careful selection in both single and double and should represent the very best that can be produced in window glass by the present methods.

"A" OR SECOND QUALITY

"A" glass is the normal selection of glass when no special selection is desired or specified and it admits of such defects as small strings or lines, small blisters when not too close to one another or located in the center of the sheet. Well flattened, the surface even, and devoid of noticeable scratches, cropper marks, burns and other prominent defects.

"B" OR THIRD QUALITY

"B" glass covers a wider range than either "AA" quality or "A" quality. It permits many of the defects inherent to the process of making such as waves, strings, lines, blisters, scratches, burns and other similar or equivalent defects. This quality embraces everything below "A" quality, not stony or full of blisters or other large defects objectionable for any common purpose, such as heavy scratches, heavy blisters, cords and sulphur stains.

26 OZ. CRYSTAL SHEET

A cylinder or blown glass heavier than the ordinary Double Strength, and graded by the same rules as window glass in first, second or third quality, measuring approximately 1/8" in thickness (technically $^{125}/_{1000}$ of an inch.)

29 OZ. CRYSTAL SHEET

A heavier blown cylinder glass, graded as above, (technically $^{135}/_{1000}$ of an inch in thickness.)

34 OZ. CRYSTAL SHEET

A heavier blown cylinder glass, graded as above, (technically $^{159}/_{1000}$ of an inch in thickness.)

3/16" OR 39 OZ. CRYSTAL SHEET

A heavier blown cylinder glass, graded as above, measuring 3/16" in thickness.

Bent Glass

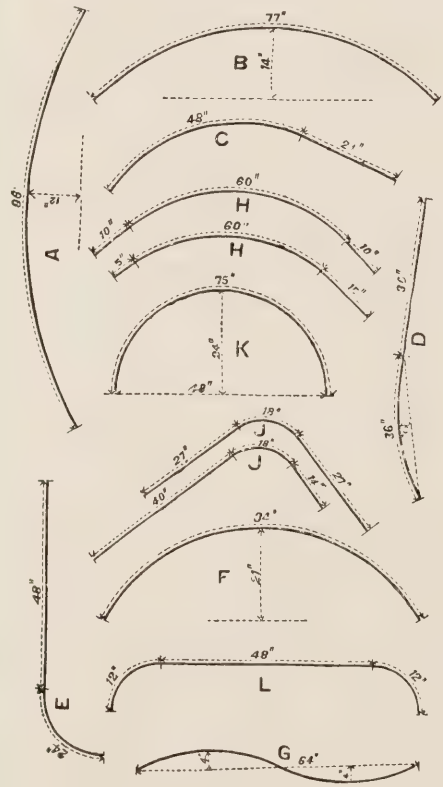
BENT Glass is artistic and attractive, and lends tone to the structure or building.

Glass Bending requires special furnaces, constructed similar to those used for annealing purposes, in Plate and Window Glass factories.

The bending is done by placing a flat sheet of manufactured glass in a mould, made to fit the shape or radius wanted, and subjecting it to a temperature sufficient to allow the glass to soften and fall to the shape of the mould. It is then annealed, by careful process, the same as in the manufacture of Plate and Window Glass.

The most popular sizes of Polished Plate Glass, used in Bent store-fronts, are 56½x96, up to 120″ or longer, Bent to ¼ Circle, on 36⅜″ radius. Frequently there are calls for larger sizes, which can be bent as large as 140 wide x 120 high—to Quarter Circle, or part of width or bend made to a regular radius and balance straight. All kinds of glass can be bent, such as Polished Plate, Window Glass, Rough, and Ribbed, Plain and ¼″ Wire Glass. Also Opalite, Vitrolite and Carrara Glass, in all Thicknesses for Wainscoating and curved Floor Cases.

The shapes are shown in accompanying drawings.



See opposite page for explanation.

BENT GLASS (Continued)

EXPLANATION OF CURVES AND DIAGRAMS

A—Curves are those which are bent to a given radius one way of the pane only, which applies to the whole length or width of the pane, and not to one part only. The depth of bend not to exceed one-eighth of the length of the bent side of pane. Example, length of the bent side of pane, 96″, depth of bend not above 12″.

B—Curves are those which are bent more than one-eighth, but not to exceed the quarter of a circle, or about 1 in 5½. Example, pane 77″, bend 14″.

C—For the same curve as B, but a part flat, the flat part not to exceed one-third. Example, pane 72″, bend 48″, flat 24″.

D—For flat curves, with one part flat, the depth of the bent part not to exceed 1 in 12, and the flat part one-half. Example, pane 72″, bend 36″, depth 3″, flat 36″.

E—For curves, the bent part not less than a 6″ radius, and not to exceed the quarter of a circle, with flat part, the flat part to exceed one-third but not to exceed two-thirds. Example, pane 72″, bend 24″, flat 48″.

F—Curves are those which are bent beyond the quarter of the circle, but not to exceed 1 in 4. Example, pane 84″, depth 21″.

G—For OG curves, depth not to exceed 1 in 16. Example, pane 64″, depth 4″.

H—For angular curves, viz:—Flat parts on each side, the centers not to exceed a quarter of a circle, the end flat parts one-fourth of the sides bent. Example, pane 80″, bend 60″, flat 10″, each side, or about 5 one side and 15 on the other.

J—For angle curves (radius not less than 6″) the center not to exceed the quarter circle, and the flat to exceed one-fourth, but not to exceed three-fourths. Example, pane 72″, bend 18″, flat 27″ each side or about 14″ on one side and 40″ on the other.

K—Curves are those which are bent beyond 1 in 4 but not to exceed the half circle (diameter not less than 12″). Example, pane 75″, depth about 24″.

L—Curves not to exceed the quarter of a circle at each side (depth of bend not less than 6″), the bent part not less than one-third, and the flat not more than two-thirds. Example, pane 72″, bend 12″ each side, center flat 48″.

Specify width (measurement around curve) first, and then the height. Preferably submit pattern or template of sweep in all cases.

Glazing

WHILE there is no uniformity in specifications governing the method of glazing different styles of glass, it is nevertheless advisable to call attention to some features which have been developed through the experience of the glass houses in this business.

APPEAL TO ARCHITECTS

It is especially desirable that all glass to be specified for a building be placed under one heading in the architect's specifications under the heading—"Glass and Glazing."

Accuracy is a necessity. Use a standard rule, true to gauge; specify the size plainly. For instance, 56 inches might be confused if written 5′ 6″, and cut 66 inches—as 5 feet 6 inches. Always specify width first. In measuring, it is advisable to allow a little play and measure inside the rabbet. See that rabbet is made to accommodate glass of the thickness ordered; i. e., order glass of proper thickness to fit rabbet. Measure the opening and see if all sides are squared, especially if metal work is to be glazed, it is essential to have perfect fit, and in large sizes it is not uncommon to find a warped frame, or not exactly square, slightly different at one side as compared with the other.

Be specific—it is better to give an abundance of information rather than leave anything indefinite, or to be taken for granted. Mistakes will follow carelessness, and corrections involve loss of time and expense.

Plate glass should rest on two pads of felt, leather, lead, oakum or soft wood blocks, one near each end, not against bare metal, or at a single bearing-point which might cause breakage through settling of building, vibration, etc. The soft wood blocks or lead strips are to be preferred.

Do not fasten or bind glazing-mouldings too tight, as it is necessary to allow for expansion and contraction, vibration and readjustment of construction.

Use pure putty. Have sash-rabbet well oiled or painted so that putty will adhere. Give fresh putty glazing time to set before handling or hanging sash. Don't try to back-putty glass with corrugated or figured surface, as the putty cannot be removed from the ridges in the glass.

Steel sash glazing requires special putty for metal rabbets.

CAUTION

When glass of any kind has been delivered to a building packed in cases or with paper between the sheets, it is advisable to store the glass under cover in a dry place and unpack it to avoid stains which come from drying out of damp hay, straw, paper, or other packing materials.

GLAZING (Continued)

Glaze prism-glass with ribs inside—flat surface outside. Regular glazing is done with uncolored putty. If colored putty is desired it should be specified accordingly. Glass is not bedded-in-putty or back-puttied unless specially ordered or specified.

Window glass is regularly glazed with the natural bow or bend outside.

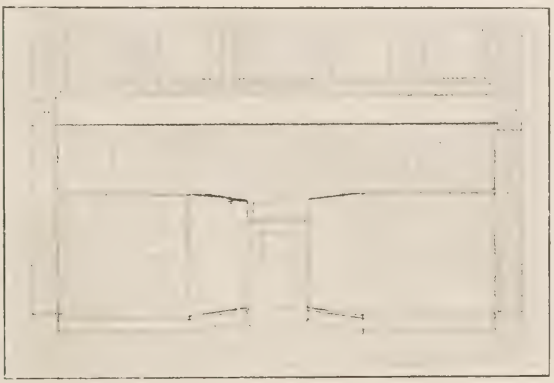
Metal Store Front Construction

THE setting of plate glass in store fronts has been the subject of a great deal of consideration on the part of architects and builders. The desire to eliminate massive bars, heavy sills and obstructing frame-work has brought into the market many kinds of devices for building show-cases and store windows which present the maximum display of merchandise to the public, and at the same time insure safety and rigidity of construction.

METAL STORE FRONT CONSTRUCTION

The use of metal corner-bars, division bars and sills and the all-glass show-case or show-window has become so universal that few old-fashioned stores remain and all modern construction is marked by the absence of bulky posts or ponderous frames.

There are several standard makes of metal store-front construction, corner-bars, dividing bars, metal sill, etc., which fasten or secure, the glass with a metal locking or clamping member and provide for drainage, ventilation and illumination if desired, which may be obtained from the various members of the National Glass Distributers' Association.



METAL STORE FRONT CONSTRUCTION (Continued)

We do not enter the brands of the several standard makes or recommend any special style of store-front construction, but it is well to make comparisons, giving attention to the necessity of substantial strength in the retaining members, and using metal bars and construction of sufficient weight to insure strength and rigidity.

It is advisable to send working drawings or detailed plans of store fronts—and the utmost care should be exercised in furnishing accurate dimensions when ordering, so that a true fit of metal may be assured, and proper allowance made for bearing contact or play of glass.

The architect should make definite specifications as to the material desired, giving names or numbers of bars, sill covering, jamb bars, jamb covering, transom bars, transom covering, style of metal finish, etc.

All-Glass Patent Fronts

ALL GLASS CLAMP STORE FRONTS

The show window of all-glass patent-front construction needs no special recommendation to those who have examined it, and the unobstructed view of the display as well as the continuous glass effect has made it a popular and attractive model for retail stores throughout the United States.

Leaded Glass

THIS is a broad field, and should be separated for special treatment in detail. Under the head of Leaded Glass there are multitudes of suggestions for every artistic emotion, and this is a subject for the expert and depends upon individual taste. That which is considered beautiful and harmonious in line and tone expressing the ideal of refinement to some, may be rated without merit or attractiveness by others, so we leave the technical artistic side of this branch of the industry and give a few suggestions and practical points of information.

Leaded Glass—without color, should be specified "Clear Leaded" or "Obscure Leaded." If some particular design is selected from catalogue, give name and catalogue number and the number designating the design.

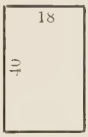
If special designs are wanted for some particular work, give description of general architectural lines, decorative scheme, etc.

All leaded work is made especially to order to sizes desired, therefore place the order giving ample time to the manufacturer to produce the windows without undue haste.

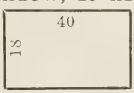
For odd shapes or odd sizes send patterns.

Give the fullest possible description with rough sketch showing grouping of window openings or any information that will assist the artist in detailing the designs.

Specify width first—for instance:—an upright window, 18″x40″



or a transom or landscape window, 40″x18″



Odd or fractional parts of inches are charged as even inches of next higher size—for example 26¼″x27½″ is figured as 28″x28″.

Circles or odd shapes are charged at the full square outside measurement.

To obtain rigid construction specify metal-set work, especially for doors, pivot swinging sash, etc.

On account of the weight, beveled plate, heavy ornamental glass, and thick material such as prism is usually specified set in metal—either plain zinc or copper plated.

All leaded glass of sufficient size is reinforced with steel strengthening bars.

Glaze leaded glass or metal set glass with steel stiffening bars inside.

Wire Glass

THE use of metal frames, metal window sash and fire-proof construction has increased the demand for wire glass until the production of the material amounts to millions of square feet annually. Not only does this glass minimize the fire-hazard, but its resisting and sustaining strength, its unyielding qualities even when cracked make it the logical glass for skylights, elevator shafts, stair-wells, etc., where these features are a consideration.

METHODS OF MAKING

Wire glass is made by three methods: 1. (Shuman process) by rolling a sheet of glass laying the wire mesh upon it while the glass is still plastic, pressing the wire-netting into the glass, and by a coincident process smoothing the surfaces. 2. (Appert or Schmertz process) by rolling a thin sheet of glass and laying the wire-mesh upon it and simultaneously pouring and rolling a second sheet of glass on top, imbedding the wire. 3. (Continuous or Solid process) by mechanically crimping the wire netting and placing same on the casting table and pouring and rolling the glass over it to produce a sheet of wire glass.

The introduction of the manufacture of wire-glass is of so recent a date as to make the volume of consumption all the more surprising, especially when it is recalled that the product was comparatively unknown twenty years ago.

STANDARD THICKNESS ¼″

Wire glass is made in sheets as large as 60″ wide and 130″ long and in several thicknesses—¼″ standard thickness for general use and approved by the National Board of Fire Underwriters.

OTHER THICKNESSES

Thinner wire glass is obtainable—3/16″ and ⅛″ being made for special purposes, but the universal demand is for ¼″ or ⅜″ or heavier, and no wire glass less than ¼″ thick is accepted under the rules of the Fire Prevention Bureaus or the National Board of Fire Underwriters.

UNDERWRITERS' REQUIREMENTS

It is necessary to follow certain rules and regulations in the making of fire-proof windows and construction, as provided by the National Fire Protection Association, and a copy of the requirements of the National Board of Fire Underwriters may be obtained from any member of The National Glass Distributers Association.

WIRE GLASS (Continued)

Extract from Rules and Requirements of the National Board of Fire Underwriters, Edition of 1906.

THICKNESS OF GLASS: Wire glass to have a thickness of at least ¼ of an inch at the thinest point.

SIZE OF GLASS: The unsupported surface of the glass allowed, shall be governed by the severity of exposure and be determined in each case by the Underwriters having jurisdiction, but in no case shall it be more than 48 inches in either dimension or exceed 720 square inches.

Windows, doors and partitions should be specified for such sizes as 15″x48″, 18″x40″, 20″x36″ and 24″x30″ to conform to the above rule where dimensions are not to exceed 720 square inches. There are also restrictions and regulations governing the depth of rabbet (¾″ deep) bearing of glass (⅝″) and style of metal frames and sash to meet the demands of fire-retardent construction and permit reglazing, etc.

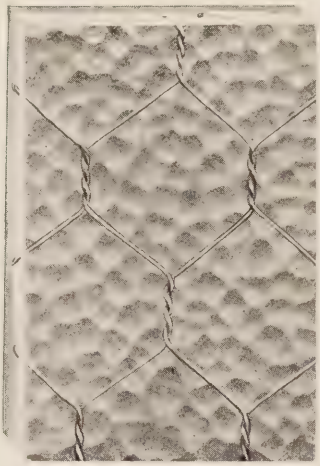
POLISHED WIRE GLASS

Wire glass is made in ordinary rolled "rough" or "ribbed" or "figured" patterns, and when ground and polished for clearer transparent vision, is specified under the term:—"Polished Wire Glass."

This is not the quality of clear polished plate, but a polished rough wire glass, with the ordinary run of defects inherent with rough glass which has polished surfaces.

POLISHED WIRE GLASS

WIRE GLASS (Continued)



Width
ROUGH WIRE GLASS

Width
RIBBED WIRE GLASS

Width
MAZE WIRE GLASS

Width
COLONIAL WIRE GLASS

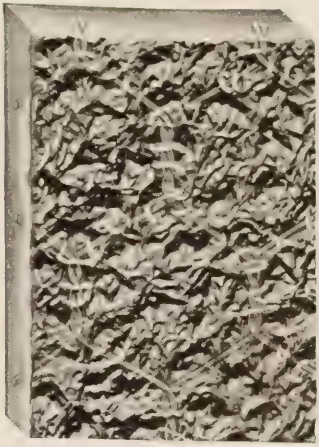
The twist of the wire runs with the length of the sheet, and should be set vertically. In ordering always specify width first.

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

See page 45 for table of maximum widths and lengths, approximate weights, etc.

WIRE GLASS (Continued)

Width
COBWEB WIRE GLASS



Width
MOSS WIRE GLASS
SYENITE WIRE GLASS

Width
ROMANESQUE WIRE GLASS

Width
MURANESE WIRE GLASS

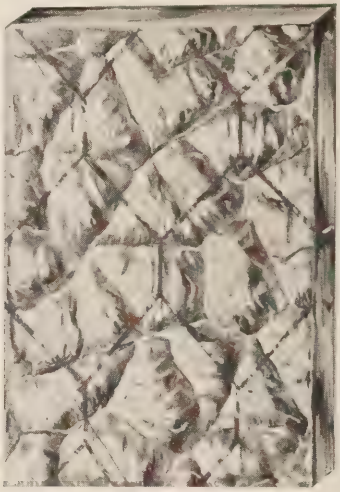
The twist of the wire runs with the length of the sheet, and should be set vertically. In ordering always specify width first.

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

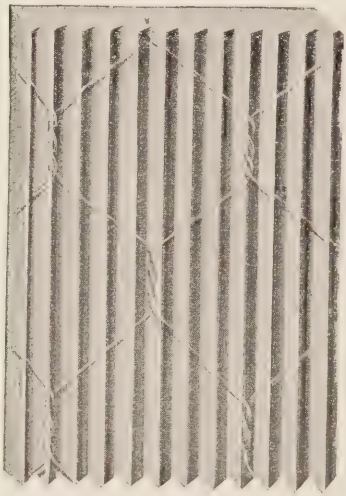
See page 45 for table of maximum widths and lengths, approximate weights, etc.

WIRE GLASS (Continued)

Width
FLORENTINE WIRE GLASS



Width
LIBERTY WIRE GLASS



Width
PENTECOR WIRE GLASS

Width
AQUEDUCT WIRE GLASS

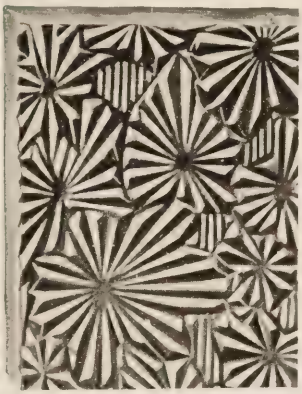
The twist of the wire runs with the length of the sheet, and should be set vertically. In ordering always specify width first.

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

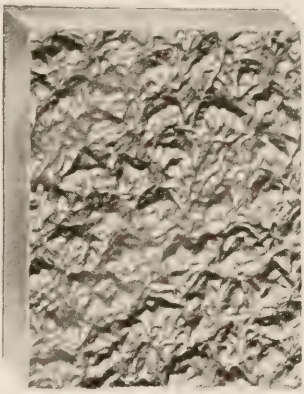
See page 45 for table of maximum widths and lengths, approximate weights, etc.

Rolled Figured Glass

THE prime object of figured glass is to supply an obscure translucent glazing material with attractive pattern of depth and character, and at the same time it must be essentially prismatic so as to admit, diffuse, and distribute the light.



Width
FLORENTINE GLASS



Width
SYENITE GLASS
MOSS GLASS

Sizes up to 48″ wide and 132″ long. Thicknesses ⅛″, 3/16″

Width
COBWEB GLASS

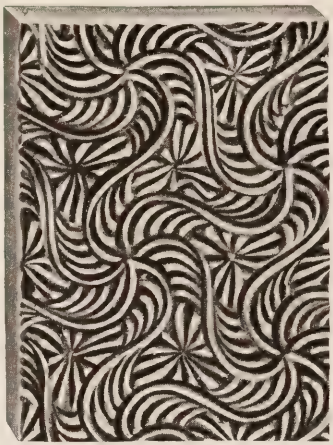
Sizes up to 54″x120″
Thicknesses ⅛″ and 3/16″
Sizes up to 60″x120″
Thicknesses ¼″ and ⅜″

Width
HOLLY GLASS.

Sizes up to 48″ wide and 132″ long, in thicknesses of ⅛″ and 3/16″

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

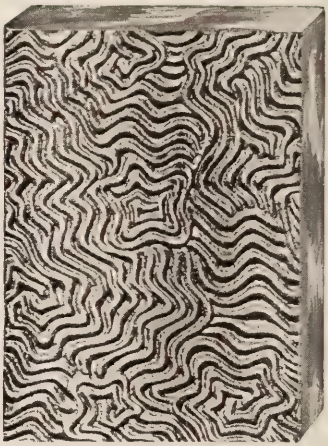
ROLLED FIGURED GLASS (Continued)



Width

MAZE GLASS

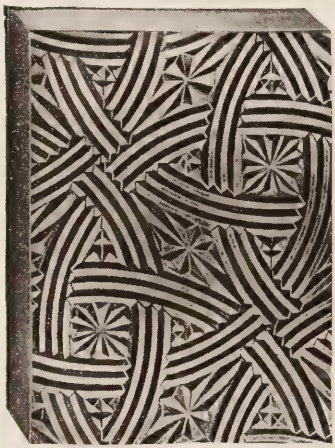
Sizes up to 48″ wide and 132″ long. Thicknesses 1/8″ and 3/16″



Width

COLONIAL GLASS

Sizes up to 44″ wide, 132″ long. Thicknesses 1/8″ and 3/16″



Width

ROMANESQUE GLASS

Sizes up to 48″ wide and 132″ long for 1/8″ thick and 60″ wide and 132″ long for 3/16″ thick.

Width

FIGURE No. 2 GLASS

Sizes up to 42″ wide and 110″ long. Thicknesses 1/8″ and 3/16″

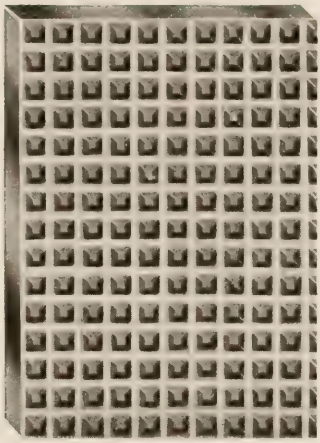
Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

ROLLED FIGURED GLASS (Continued)

Width

MURANESE GLASS

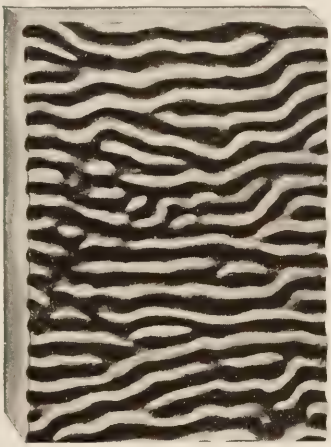
Sizes up to 42″ wide and 110″ long. Thicknesses ⅛″ and 3/16″



Width

PYRAMID GLASS

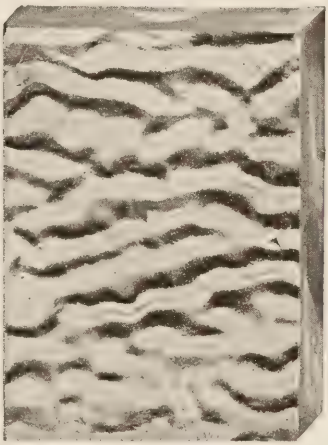
Sizes up to 48″ wide, 132″ long. Thickness ¼″



Width

ONDOYANT GLASS

Sizes up to 30″ wide and 100″ long. Thickness ⅛″



Width

RIPPLED GLASS

Sizes 30″ wide, 90″ long. Thickness correct for leading. Mention width first in ordering.

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

ROLLED FIGURED GLASS (Continued)

Width

LIBERTY GLASS

Sizes up to 44″ wide and 132″ long, in thicknesses 1/8″ and 3/16″

Width

PENTECOR GLASS

Thicknesses 1/8″ and 3/16″
Sizes 18″ to 48″ wide and up to 132″ long.

Width

AQUEDUCT GLASS

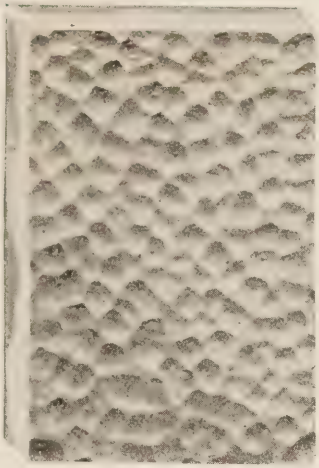
Sizes up to 54″x120″
Thicknesses 1/8″ and 3/16″
Sizes up to 62″x120″
Thicknesses 1/4″ and 3/8″

SKYLIGHT GLASS

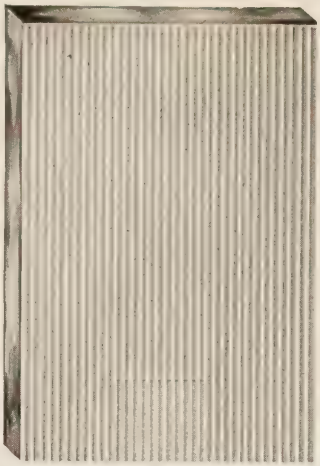
Skylight Glass, adapted to conduct or lead away moisture throughout its entire length, even when glazed at a comparatively slight inclination, and so prevent moisture from dropping.

Stock Sheets, packed in cases containing 350 to 500 square feet in any regular even inch width.

ROLLED GLASS (Continued)



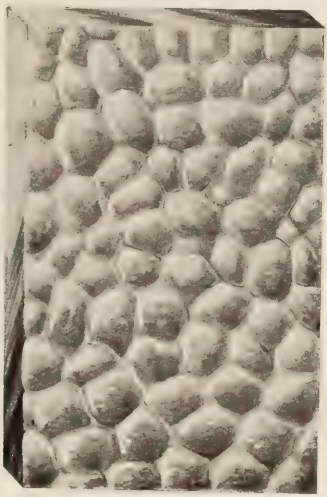
Width
ROUGH GLASS



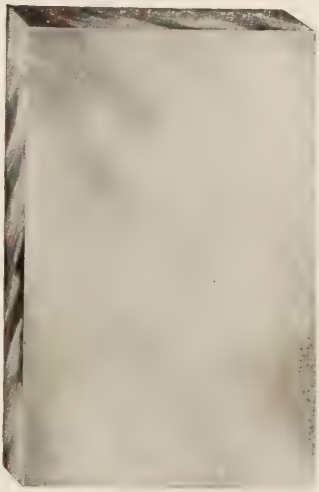
Width
*RIBBED GLASS

Sizes up to 48″ wide and 132″ long. Thicknesses 1/8″, 3/16″ 1/4″, 3/8″ and 1/2″

* The rib runs with the length of the sheet.
In ordering always specify width first.



Width
HAMMERED CATHEDRAL
Size 30″ wide, 90″ long.



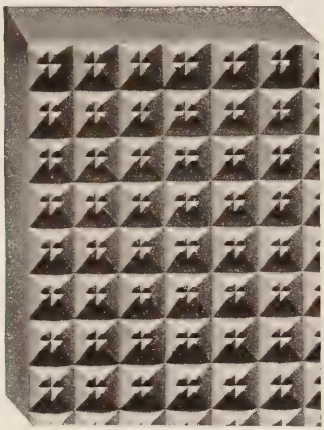
Width
SMOOTH CATHEDRAL
Thickness correct for leading.

Stock Sheets, packed in cases containing 350 to 500 square feet.

Ornamental Polished Plate Prismatic Glass

(One side ground and polished.)

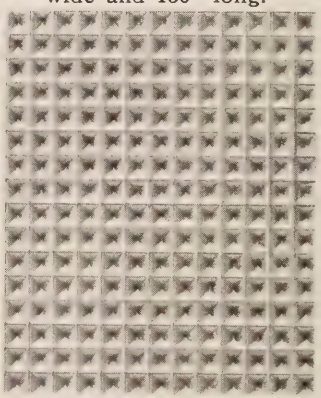
A BEAUTIFUL product for partitions, door-lights, vestibule glazing, car or boat windows or ceiling lights, store or bank fixtures, or for street windows, where white light is wanted, with ornamental design.



Width
APEX GLASS
(Semi-Obscure)
Made in sizes up to 50″ wide and 100″ long.

Width
IDEAL GLASS
(Semi-Obscure)
Made in sizes up to 54″ wide and 130″ long.

Width
PYRAMID GLASS
(Semi-Obscure)
Made in sizes up to 48″ wide and 132″ long.

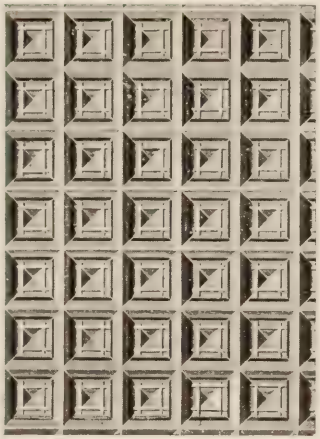


Style O-1.
"IMPERIAL"
PRISM-PLATE GLASS
(Semi-Obscure)
Made up to 70″x82″

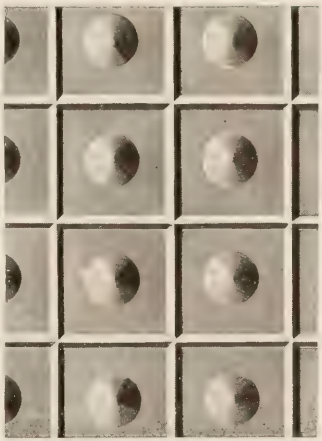
A polished Plate Prismatic, Figured Glass, about ¼″ thick.

ORNAMENTAL POLISHED PLATE PRISMATIC GLASS (Continued)

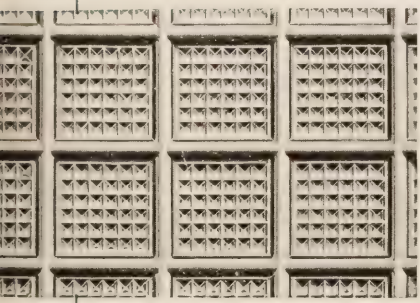
(One side ground and polished.)



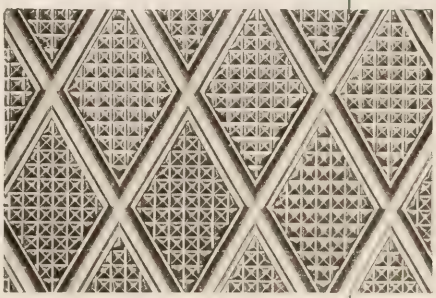
Width
Style O-2.
"IMPERIAL"
PRISM-PLATE GLASS
(Semi-Obscure)
Made up to 70″x82″



Width
Style O-3.
"IMPERIAL"
PRISM-PLATE GLASS
(Transparent)
Made up to 70″x82″



Width
Style O-4.
"IMPERIAL"
PRISM-PLATE GLASS
(Semi-Obscure)
Made up to 70″x82″



Width
Style O-5.
"IMPERIAL"
PRISM-PLATE GLASS
(Semi-Obscure)
Made up to 70″x82″

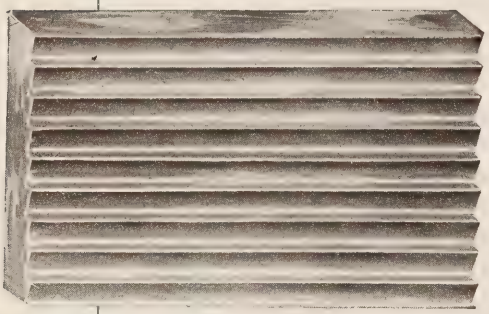
A polished Plate Prismatic, Figured Glass, about ¼″ thick.

Prism Glass

BY the use of prism glass in windows, transoms, skylights, etc., it is possible to increase the amount of daylight in the building and avoid the necessity for artificial lighting to a remarkable extent.

The efficiency of the prism as a light conveyor is well established, and a proper installation of prism glass has often been the source of great satisfaction and economy, bringing the natural light of day into dim quarters where gas or electric lighting would otherwise be necessary.

It must not be expected that prism glass will PRODUCE light, and the ordinary laws of nature will prevail with prism glass or any other, but the refractory qualifications of the prism ribs can be used to diffuse light and by their peculiar powers will illuminate the remote sections of a room which would be in dark shadow, giving to the interior an increased light which the ordinary glass would not admit.

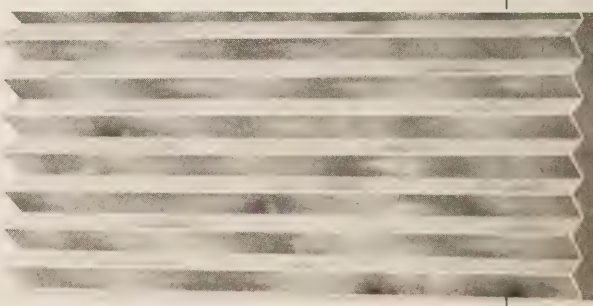


SHEET PRISM GLASS

Sizes up to 60″ high, 138″ long. Thicknesses up to 42″ high, ¼″ Thicknesses 42″ to 60″ high, 5/16″. Mention height in ordering. Prism ribs run horizontally with the length of the sheet.

"IMPERIAL" PRISM-PLATE GLASS

(One Side Ground and Polished.) Made up to 82″x 72″. Prism Plate Glass is a beautiful product, cuts with a diamond like plate glass, and has the same strength and durability.



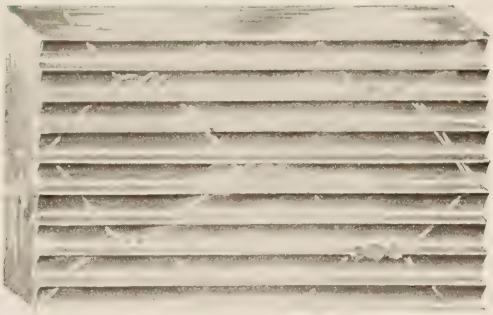
PRISM GLASS (Continued)

PRISM WIRE GLASS

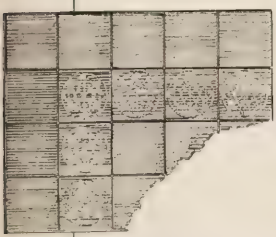
For use where increased light as well as protection is desired.

Sizes up to 42″ high, 138″ long. Thickness 3/8″. Mention height in ordering.

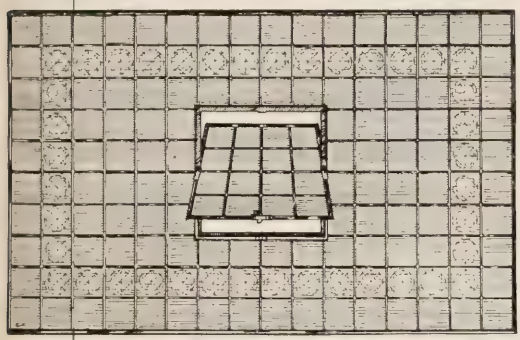
Approved by Underwriters.



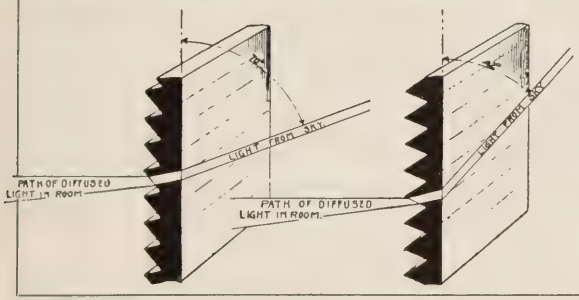
PRISM TILES



Pressed Prism Tiles are made, either in 4″x4″ or 5″x5″ squares. The fancy border tiles give a distinctly artistic appearance as shown in the sectional drawing. Tile prism work is set in hard-metal glazing, either zinc finish or copper-plated, with ornamental border tiles if desired, all lights sufficiently re-enforced with steel bars to make them solid and rigid. Pivot ventilators are mounted in steel standards, and may be equipped with screens.



Geometric designs made of sheet prism glass set in plain metal or copper-plated, may be obtained, and used with very artistic and satisfactory results, also prism glass set in solid copper bars, if desired.



Illustrating Refracting Properties of Two Prism Angles

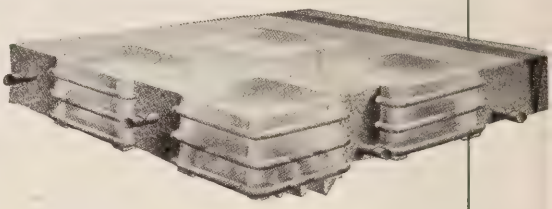
PRISM GLASS (Continued)

SIDEWALK GLASS

Sidewalk Slabs with glass in reinforced concrete panels have become popular for the lighting of dark basements, vaults and cellars.

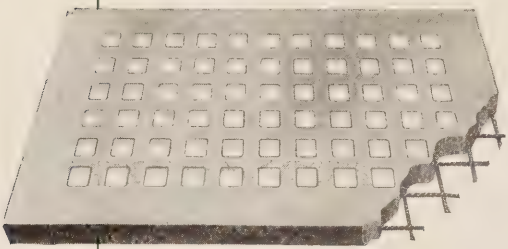
The glass of square, or circle shape, is imbeded in concrete reinforced with steel bars to secure substantial construction and the panel made to any desired dimension.

GLASS LENSES



Various forms of glass lenses are used for different conditions, either flat pressed units, or drop-lenses of a single prism or multiple prism lenses according to the effect desired.

The slab is made up complete, glazed and finished in any desired size to fit opening, and where more than one slab is required, the necessary T bars are cut to proper length and shipped with the slabs.



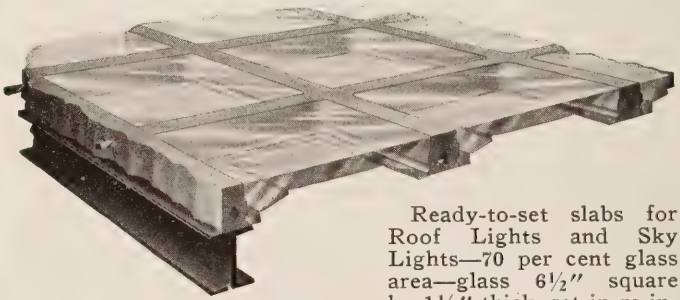
DESCRIPTION OF CONDITIONS

Sizes of openings must be accurately given either by detailed drawing or blue-print and the conditions of the space to be daylighted should be described fully in order to secure the proper prism-lenses for the best results.

INSTALLATION

The slabs can be installed by any ordinary workman, following directions which accompany shipment, as sizes are exact and the slabs of perfect fit, ready for caulking of joints.

SKYLIGHT, FLOORLIGHT

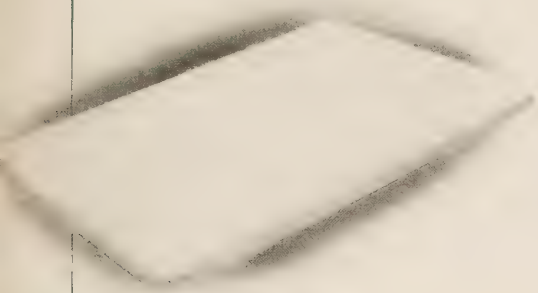


Ready-to-set slabs for Roof Lights and Sky Lights—70 per cent glass area—glass 6½″ square by 1¼″ thick, set in re-inforced concrete.

Milk-White, Opalite, Vitrolite, Carrara Glass

A MILK-WHITE GLASS, homogeneous and opaque, with brilliant natural polish, annealed surface, non-porous, and non-staining, impervious to acid or alkali, sanitary, and therefore used extensively for bath-rooms, counters and table tops.

Natural Finish, Hone Finish or Polished.



SIZES AND THICKNESSES

Manufactured in sheets as large as 60″ wide and as long as 110″ of various thicknessess: 3/16″, 5/16″, 7/16″, ½″, 9/16″, ⅝″, ¾″, 1″, 1¼″, 1½″.

Can be treated, ground, beveled, chamfered, drilled and cut as readily as marble and possesses qualities far superior.

USES

The non-absorbing, sanitary quality of the material, its cleanliness, durability and beauty make it particularly adaptable for structural purposes, such as wainscotings, wall-covering, store front bulkheads, bath-rooms and showers, lavatories, hospitals, surgical operating rooms, barber shops, etc. Also for counter tops and tables, window-display plates, shelves, refrigerators, sinks and drains, medicine cabinets, kick-plates, etc.

BLACK GLASS

A product of pure black, uniform color, made in sizes and thicknesses corresponding to the white glass described above. Polished or hone finished. Its uses and qualities are the same as the white glass.

BLACK GLASS

Also used extensively, in the honed or velvet finish for black-boards in schools, or in combination with the white in structural work—and for deal-plates, table tops, etc.

WHITE OPAL

A milky-white glass, with one surface cast in natural smooth finish, other surface ribbed. Made in ⅛″, 3/16″, ¼″ and 5/16″ thicknesses.

ROLLED OPAL

Chipping and Grinding Enameling, Embossing, Etching

THE ornamental design of chipped glass, with its brilliant pattern has made it popular where obscure or semi-transparent glazing is desired and its use in high-class fixtures, windows or partitions, (especially chipped polished plate) has established its position as a favorite for banks, government buildings, post offices, etc.

GRINDING OR SANDBLASTING

The glass is first ground, or sandblasted by subjecting the sheet to a blast of fine sand (under air pressure) which attacks the polish on the exposed side, leaving a milky or frosted surface.

Single Process Chipped

CHIPPING

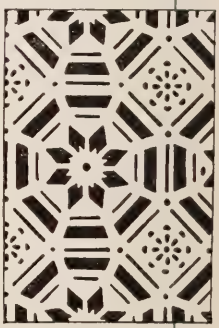
The ground or sandblasted surface of the glass is coated with glue, which is subjected to a gradual heating process. The drying glue peels or shrinks off in flakes, tearing off slivers of the glass in various forms, each flake leaving its pattern or imprint mould in the clear glass. The crinkling of the glue is according to nature and no two flakes are alike, yet the general appearance of the sheet is uniform after the shells of glue are off the glass.

SINGLE PROCESS

The single coat of glue pees off, leaving lines of the original ground or sandblasted surface. Such chipping is known as single process work, and the product as "Single Process Chipped Glass."

DOUBLE PROCESS

When the sheet is recoated with glue and a second chipping performed, the sandblast lines have disappeared entirely and such is double process work which produces "Double Process Chipped Glass."



Octagon Enamel

GROUND AND CHIPPED GLASS

Double strength window glass and plate glass as well as rolled rough glass in any size may be ground and chipped (either single process or double process) but it is well to remember that the

CHIPPING AND GRINDING, ENAMELING, EMBOSSING, ETCHING (Continued)

blasting and heating has a tendency to make the material brittle which might cause breakage in extremely large sizes.

CLEAR MARGIN, LETTERING, ETC.

When a margin of clear glass, clear design or lettering, is desired in either ground or chipped glass the "pattern" is protected from the sandblast or the coating of glue and the balance of the surface treated, as above described.

ENAMELED GLASS

A set pattern ground over the whole surface of the glass, usually in some geometric figure and commonly upon window glass.

CLEAR AND OBSCURE ENAMELED

When the pattern is blasted leaving the background clear the glass is called "clear" enamel, while the same process upon ground glass produces "obscure" enamel.

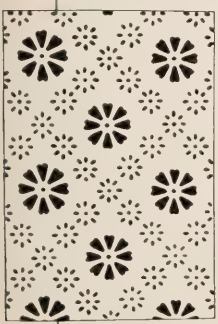
Double Process Chipped

SANDBLAST PATTERNS

As in the enamel glass, there are many patterns of sandblast glass made by the same process, which are commonly used for doors and transoms, deck-lights, etc. Picture designs in stencils to suit any taste, imitation lace designs and combination chipped and sandblasted patterns may be made up according to fancy.

KITCHEN CABINETS

Geometric designs of chipped glass, enameled or sandblasted glass are used extensively in kitchen cabinets, cupboards, etc.



Strawberry Enamel

EMBOSSING, ETCHING

EMBOSSED GLASS

Where soft white light is desired, without conspicuous decorative pattern in the glass, embossed plate is both effective and rich in appearance. Translucent, yet not transparent, with its delicate satin finish it is extensively used for store and bank fixtures, street windows, partitions, doors and vestibules.

CHIPPING AND GRINDING, ENAMELING, EMBOSSING, ETCHING (Continued)

ACID WORK It is produced by treating the surface of the glass with hydrofluoric acid, which eats into the annealing and gives the glass a subdued and delicate caste, rendering it semi-obscure or completely obscure, according to the effect desired.

Embossed lines, letters or designs are sunken into the glass, hence the "embossed" effect.

ETCHED GLASS By the use of hydrofluoric acid, suspended in certain chemicals which modify its strength, the surface of a plate of glass may be etched in snow white effect which makes the glass obscure. Since the acid does not eat into the glass in this process, there is no perceptible depression upon the surface and the appearance is similar to sandblast or ground glass of fine texture. Stencil designs of intricate detail may be worked upon the surface, by etching through a reverse pattern which is protected from the acid by a resisting composition.

Colored Glass

MANY colors and tints of Opal glass, Cathedral glass and Opalescents are used for leaded glass, stained windows, lamp shades and sometimes for sash glazing where the purposes are served by such effects as colors produce, and almost any desired shade or combination of color in variegated tints can be obtained.

CATHEDRAL GLASS

Cathedral glass is made in the ordinary hammered pattern (see page 34) or smooth surfaced, and cast in sheets of approximately ⅛″ thickness which measure about 30″x90″, and packed in stock sheets, approximately 300 to 350 square feet to the crate.

OPALESCENT GLASS

Opalescent is made in smooth surface or granite surface and cast in sheets about 26″ wide by 40″ to 50″ long, and packed in cases of approximately 125 square feet, net weight of glass 200 pounds.

COLORED FIGURED GLASS

Such patterns as Rippled, Moss, Florentine, etc., (see pages 30 and 32) may be obtained in all the standard colors and shades.

POT COLORS

Double strength and single strength Ruby, Green, Blue, Orange, Violet and White in solid pot-colors are packed 100 square feet to the case, measuring as large as 37″x59″. This glass is used extensively for railroad switch-lights and signals, dials, lanterns, etc.

FLASHED COLORS

Double strength and single strength flashed colored glass is made by an ingenious method of blowing a thin film of colored glass on the surface of clear glass, and is used extensively for embossing to procure contrast lettering in signs, etc. Made in the same colors and sizes and packed the same as pot colors.

MAXIMUM SIZES, THICKNESSES AND APPROXIMATE NET AND GROSS WEIGHTS

PLAIN FIGURED GLASS

STYLE	Thickness	Maximum Width	Maximum Length	Approximate Net Weight per Sq. Ft.	Approximate Shipping Weight per Sq. Ft. Pounds
Florentine	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
Syenite	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
Moss	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
" (Thin)	3/32	40	126	1¾ lbs.	2¼ lbs.
Maze	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
Holly	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
Mystic	1/8	44	132	2 lbs.	2½ lbs.
"	3/16	44	132	2½ lbs.	3¼ lbs.
Muranese	1/8	42	110	2 lbs.	2½ lbs.
Ondoyant	1/8	30	110	1¾ lbs.	2¼ lbs.
Fig. No. 2	1/8	42	110	2 lbs.	2½ lbs.
Fig. No. 2	3/16	42	110	2½ lbs.	3¼ lbs.
Romanesque	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	60	132	2½ lbs.	3¼ lbs.
Hammered Cathedral	3/32	30	90	1½ lbs.	2 lbs.
Double Rolled "	3/32	30	90	1½ lbs.	2 lbs.
Opalescent "	3/32	30	90	1½ lbs.	2 lbs.
Opal	1/8	30	40	1½ lbs.	2 lbs.
Rippled	1/8	30	90	1½ lbs.	2 lbs.
Rippled (Thin)	3/32	30	90	1¼ lbs.	1¾ lbs.
Colonial	1/8	44	160	2 lbs.	2½ lbs.
"	3/16	44	160	2½ lbs.	3¼ lbs.
Pyramid	1/4	48	132	3¾ lbs.	4½ lbs.
Carnation	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
Liberty	1/8	48	126	2 lbs.	2½ lbs.
"	3/16	48	126	2½ lbs.	3¼ lbs.
Cobweb	1/8	54	120	2 lbs.	2½ lbs.
"	3/16	54	126	2½ lbs.	3¼ lbs.
"	1/4	62	120	3¾ lbs.	4½ lbs.
"	3/8	62	120	5 lbs.	6 lbs.
Aqueduct	3/16	54	120	3¼ lbs.	4 lbs.
"	1/4	60	120	4½ lbs.	5¼ lbs.
"	3/8	60	120	5¾ lbs.	6¾ lbs.

PRISM GLASS

		Height	Length		
Prism (Sheet) Thin	1/4	42	120	3½ lbs.	4¼ lbs.
Prism (Sheet) Regular	5/16	60	138	4 lbs.	4¾ lbs.
Glazed Prism Tiles	5/16			5¼ lbs.	6½ lbs.
Prism Wired Glass	3/8	42	138	5 lbs.	6 lbs.
Pentecor	1/8	48	132	2½ lbs.	3 lbs.
"	3/16	48	132	3 lbs.	4 lbs.
"Imperial" Prism-Plate Glass	3/8	72	82	4½ lbs.	5¼ lbs.

ROUGH, RIBBED OR CORRUGATED

Rough	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
"	1/4	62	136	3¾ lbs.	4½ lbs.
"	3/8	62	132	5¼ lbs.	6 lbs.
"	1/2	140	240	7½ lbs.	8 lbs.
Ribbed	1/8	48	132	2 lbs.	2½ lbs.
"	3/16	48	132	2½ lbs.	3¼ lbs.
"	1/4	62	136	3¾ lbs.	4½ lbs.
"	3/8	62	132	5¼ lbs.	6 lbs.
"	1/2	48	130	7½ lbs.	8 lbs.

MAXIMUM SIZES, THICKNESSES AND APPROXIMATE NET AND GROSS WEIGHTS (Continued)

WIRED GLASS

STYLE	Thickness	Maximum Width	Maximum Length	Approximate Net Weight per Sq. Ft.	Approximate Shipping Weight per Sp. Ft. Pounds
Polished Wired Glass	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	5/16	48	130	4 lbs.	4¾ lbs.
" " "	5/8	46	130	8 lbs.	8½ lbs.
Maze " "	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	3/8	48	130	5¼ lbs.	6 lbs.
Romanesque " "	1/4	48	130	3¾ lbs.	4½ lbs.
Syenite " "	1/4	48	130	3¾ lbs.	4½ lbs.
Muranese " "	1/4	42	110	3¾ lbs.	4½ lbs.
Cobweb " "	1/8	48	130	2 lbs.	2½ lbs.
" " "	3/16	48	130	2½ lbs.	3¼ lbs.
" " "	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	3/8	48	130	5¼ lbs.	6 lbs.
Holly " "	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	3/8	48	130	5¼ lbs.	6 lbs.
Prism " "	3/8	42	138	5 lbs.	6 lbs.
Pentecor " "	1/4	40	130	4 lbs.	5 lbs.
Pyramid " "	1/4	48	132	3¾ lbs.	4½ lbs.
Aqueduct " "	9/32	48	132	4¼ lbs.	5 lbs.
Rough " "	1/8	48	130	2 lbs.	2½ lbs.
" " "	3/16	48	130	2½ lbs.	3¼ lbs.
" " "	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	3/8	48	130	5¼ lbs.	6 lbs.
" " "	1/2	48	130	7½ lbs.	8 lbs.
Ribbed " "	1/8	48	130	2 lbs.	2½ lbs.
" " "	3/16	48	130	2½ lbs.	3¼ lbs.
" " "	1/4	48	130	3¾ lbs.	4½ lbs.
" " "	3/8	48	130	5¼ lbs.	6 lbs.
" " "	1/2	48	130	7½ lbs.	8 lbs.
Rough Wire Floor Glass	3/4	12	12	8 lbs.	9¾ lbs.
Ribbed " " "	3/4	12	12	8 lbs.	9¾ lbs.
Ground " " "	3/4	12	12	8 lbs.	9¾ lbs.

POLISHED FIGURED GLASS

Apex.....about	1/4	50	100	4 lbs.	4¾ lbs.
Ideal.....	1/4	54	130	4 lbs.	4¾ lbs.
Pyramid.....	1/4	48	132	4 lbs.	4¾ lbs.
"Imperial" Prism-Plate..about	1/4	70	82	3¾ lbs.	4½ lbs.
" Style 01..... "	1/4	70	82	3¾ lbs.	4½ lbs.
" Style 02..... "	1/4	70	82	3¾ lbs.	4½ lbs.
" Style 03..... "	1/4	70	82	3¾ lbs.	4½ lbs.
" Style 04..... "	1/4	70	82	3¾ lbs.	4½ lbs.
" Style 05..... "	1/4	70	82	3¾ lbs.	4½ lbs.

POLISHED PLATE GLASS AND MIRRORS

Polished Plate Glass and Polished Plate Mirrors	1/8	See page 4	See page 4	2 lbs.	2½ lbs.
	3/16			2½ lbs.	3¼ lbs.
	1/4			3½ lbs.	4¾ lbs.
	5/16			3¾ lbs.	5 lbs.
	3/8			5 lbs.	6 lbs.
	1/2			7¼ lbs.	8 lbs.
	5/8			8½ lbs.	9¼ lbs.
	3/4			9½ lbs.	10½ lbs.
	7/8			11 lbs.	13 lbs.
	1			13 lbs.	15 lbs.
	1 1/4			16 lbs.	19 lbs.
	1 1/2			20 lbs.	24 lbs.

The Builders

All are architects of Fate,
Working in these walls of Time;
Some with massive deeds and great,
Some with ornaments of rhyme.

Nothing useless is, or low;
Each thing in its place is best;
And what seems but idle show
Strengthens and supports the rest.

For the structure that we raise,
Time is with materials filled;
Our todays and yesterdays
Are the blocks with which we build.

Truly shape and fashion these;
Leave no yawning gaps between;
Think not, because no man sees,
Such things will remain unseen.

* * * * * * * * * * * * * *

Build today, then, strong and sure,
With a firm and ample base;
And ascending and secure
Shall tomorrow find its place.

Thus alone can we attain
To those turrets, where the eye
Sees the world as one vast plain,
And one boundless reach of sky.

—Longfellow.